DANGEROUS WASTE MANAGEMENT

***Căpăţînă** Camelia[1], G**ămă**neci Gheorghe[2]*

„Constantin Brâncuşi" University of Târgu-Jiu, Faculty of Engineering, Geneva 3, 210152, Gorj, România, e-mail: cam@utgjiu.ro

ABSTRACT. According to the Romanian legislation, waste managements refers to the collection, transport, valorisation and removal of waste, including the supervision of these operations and maintenance of the storage areas after their closing.
Dangerous waste are those waste whose characteristics or production processes include one or several of the characteristics involving risk, for instance explosives that favour the occurence of fire, easily inflammable, iritating, poisonous and risky for health, cancer, corrosive, mutagene, eco-toxic, constitutive and characteristics of waste that make them become dangerous.
The paper presents experimental determinations of the content of heavy metals of the soil in an area related to a warehouse of dangerous metallic waste and the advantages of dangerous waste management.

УПРАВЛЕНИЕ НА ОПАСНИ ОТПАДЪЦИ

Чапафина Камелия*, *Джеманеши Георджe
Университет „Константин Бранкуши", Инженерен факултет, ул. Женева 3, 210152, Горж, Румъния, e-mail: cam@utgjiu.ro

РЕЗЮМЕ. Съгласно румънското законодателство управлението на отпадъците представлява събиране, транспортиране, оценка и отстраняване на отпадъците, включително надзор на тези операции и поддържане на депата за отпадъци след тяхното закриване.
Опасни са тези отпадъци, чиито свойства или производствени процеси включват една или няколко от характеристиките на риска, например взривни вещества, които създават опасност от възникването на пожари, лесно възпламеними вещества, дразнещи, отровни или опасни за здравето вещества, канцерогенни, корозиращи, мутагенни, еко-токсични и други вещества, които характеризират отпадъците като опасни.
В доклада е представено експериментално определяне на съдържанието на тежки метали в почвата около площадката на съоръжение за съхраняване на опасни метални отпадъци и предимствата на управлението на опасните отпадъци.

Introduction

Waste management options have the following decreasing order of priorities [1-8]:

- occurrence prevention – by applying clean technologies in waste generating activities;
- quantities reduction – by applying the best practices in every waste generating activity field;
- valorisation – through reuse, material recycling and energy recovery;
- elimination – through incineration and storage.

The National Strategy for Waste Management consists of four objectives:

- general strategic objectives for waste management;
- strategic objectives specific to certain waste flows;
- general strategic objectives for dangerous waste management;
- strategic objectives specific to certain flows of dangerous waste.

The general objectives regarding dangerous waste management consist of several fields of activity, every field having one or several main objectives which in turn consist of several subsidiary objectives.

The first field within the general strategy of dangerous waste management is politics and the legislative framework. This has the main objective of creating a dangerous waste management system that is rational from ecologic point of view, efficient from economic point of view and just from social point of view.

Its subsidiary objectives are:

- creating suitable administrative and legislative systems that provide the owners of dangerous waste incentives for complying with the legal obligations;
- transposing and constant implementation of EU objectives step by step.

The second field is represented by institutional and organization aspects and has the main objective of consolidating the administrative capacity of governmental institutions at all the levels (national, regional, county) with legal responsibilities.

The following field of the strategy is that of human resources. This has the main objective of providing human resources as number and professional training at all levels, and the subsidiary objective of providing enough and well-prepared personnel both in the public field and in the private field.

Another field is the prevention and minimization of waste generation, this field consisting of four main objectives:

- promoting and applying the principle of dangerous waste generation prevention and, to the extent possible, of the principle of proximity. This has the main subsidiary objective of spreading waste minimization techniques and improved treatment specific to various industries;
- minimizing the impact of dangerous waste on health and environment, with subsidiary objective related to the steps and actions made for the authorization and enterprises and plants regulated by the law;
- maximizing the efficient use of resources;
- increasing productivity and costs decrease.

The following field of dangerous waste management strategy refers to the material recovery (recycling) and energy recovery. This field has three main objectives:

- maximization of resources efficient use, having the subsidiary objective of promoting non-ferrous materials recycling using the existing foundries;
- minimizing the risk of dangerous waste impact on health and environment with subsidiary objective of promoting the decision of thermal recycling of dangerous waste in the cement furnaces;
- productivity increase and costs decrease.

Waste collection and transport is the following field of the strategy. The main objective of this field refers to the establishment of dangerous waste collection and transport services and the subsidiary objective refers to the assurance that their collection and transport comply with EU requirements.

Another field refers to waste treatment and removal with the main objective of dangerous waste removal in an ecologic, rational and economically efficient and socially acceptable way.

This, in turn, has several subsidiary objectives:

- encouraging dangerous waste treatment for purposes of:
- valorisation (if possible);
- handling facility;
- removal;
- dangerous characteristics decrease;
- providing adequate conditions for waste treatment and removal facilities;
- assurance that facilities (plants) are designed, built and operate at EU standards;
- facilitating the export of certain dangerous waste for rational ecologic management.

The following field refers to contaminated fields management, with two main objectives:

- providing public health by preventing/minimizing population exposure to contaminated fields, having the subsidiary objective of providing the information regarding contaminated fields to the public;
- preventing the occurrence of new contaminated fields.

The ninth field refers to the financing of the dangerous waste management system. This field has two main objectives:

- creating and using economic-financial systems and mechanisms for dangerous waste management in compliance with the general principles, mainly of the principle according to which the polluter pays. The subsidiary objective refers to the creation and implementation of economic and financial instruments that provide the creation of a reliable market of industrial and dangerous waste.
- improving the access of industry to the necessary financing for efficient and economically justified investmentsin the field of environmental protection, clean production technologies and plants modernization.

The tenth field refers to the computer system. It has two main objectives:

- creating a computer system regarding dangerous waste in compliance with international and EU requirements with the following subsidiary objectives:
- facilitating the improvement of regulation and control in this field;
- providing information at regional and national level in relation to planning in the field of dangerous waste and strategy development;
- providing the information regarding waste management to the public;
- implementing a data reporting system regarding dangerous waste management in accordance with EU requirements.

The last field refers to the increase of the awareness level. It consists of three main objectives, each of them with subsidiary objectives:

- Increasing people's awareness regarding the impact of dangerous waste on health and environment with two subsidiary objectives:
  - increasing the awareness on inadequate practices consequences;
  - increasing the awareness on the need for good practices;
- Increasing the awareness on the benefits of applying clean practices and technologies, having the following subsidiary objectives:
  - increasing awareness at the level of industry and I.P.P.C.;
  - increasing awareness at the level of the local and central environmental administration and I.P.P.C.;
- Increasing awareness regarding the obligation for the producer to take responsibility and the principle according to which the polluter pays.

Experimental

In order to underline the influence of a dangerous waste storage facility over the environment, measurements have been made over the content of heavy metals in the soils from the related areas of a metallic waste storage facility from Tg-Jiu city.

Waste (iron, aluminium, lead) are deposited directly on the soil, without complying with the legal regulations regarding their storage.

Soil samples were collected 0 – 20 cm deep. Sampling points of soil samples were established at various distances from the pollution source, as follows:

- point 1 – 14 m V;
- point 2 – 48 m V;
- point 3 – 480 m E;

- point 4 – 480 m N;
- point 5 – 1490 m E.

Heavy metals extraction from soil samples was made with concentrated sulphuric acid and oxygenated water 50%, with the help of an electric mineralizator (Digestal HACH) [9].

The determination of the concentration of heavy metals: copper, zinc, cadmium, chrome and lead was made through atomic absorption spectrophotometry [9].

Results and discussion

Results interpretation has been made in accordance with the provisions of the Order of the Ministry of Waters, Forests and Environmental Protection no. 756/1997.

Table 1.
Heavy metals content in the soil

Sampling point	*Profile (cm)*	*Concentration (p.p.m.)*				
		Cu	*Zn*	*Cd*	*Cr*	*Pb*
Point 1	*0-20*	*253*	*0,0*	*0,0*	*54,5*	*75,0*
Point 2	*0-20*	*139,8*	*127,1*	*0,0*	*41,7*	*32,0*
Point 3	*0-20*	*73,6*	*78,1*	*0,0*	*50,7*	*2,0*
Point 4	*0-20*	*29,8*	*63,1*	*0,0*	*42,9*	*0,0*
Point 5	*0-20*	*25,0*	*71,6*	*0,0*	*43,9*	*0,23*

Table 2.
Reference values for traces of chemical elements in the soil

Chemical element	*Natural values (p.p.m.)*	*Alert thresholds (p.p.m.)*		*Intervention thresholds (p.p.m.)*	
		Uses types		*Uses types*	
		Sensitive	*Less sensitive*	*Sensitive*	*Less sensitive*
Cadmium (Cd)	*1*	*3*	*5*	*5*	*10*
Cobalt (Co)	*15*	*30*	*100*	*50*	*250*
Chrome (Cr)	*30*	*100*	*300*	*300*	*600*
Copper (Cu)	*20*	*100*	*250*	*200*	*500*
Quicksilver (Hg)	*0,1*	*1*	*4*	*2*	*10*
Nickel (Ni)	*20*	*75*	*200*	*150*	*500*
Lead (Pb)	*20*	*50*	*250*	*100*	*1000*
Zinc (Zn)	*100*	*300*	*700*	*600*	*1500*

Soil tests performed during a year and presented in table 1 monitored the level of soil loading with heavy metals as well as the comparison of the results with normal loading values and reference values presented in table 2.

The lands were soil samples were collected for determining the content of heavy metals are part of the sensitive uses category, meaning that they are used for agricultural purposes and as residential areas.

The values of the copper concentration in the soil are presented in figure 1:

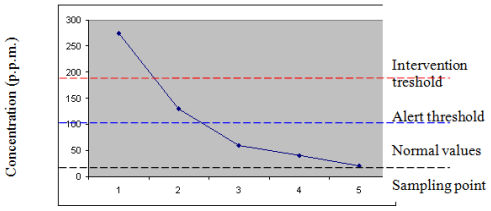

Fig.1. Variation of copper concentration in the soil

Of the five measurements made for copper, three of them exceeded the normal value, one exceeded the normal value and the alert threshold and one exceeded the normal value and the intervention threshold.

The highest value for copper was recorded on the distance of 14 m, west from the pollution source, which is 12,5 times more than the normal value and 2,4 times, respectively 1,1 times over the alert and intervention thresholds. The smallest value was recorded at the longest distance from the source.

In the case of zinc, excesses were recorded only regarding the normal value of this element in the soil. Therefore, at sampling point 2, the measured value is 27,1% times higher than the normal value and is 42,3% of the alert threshold value and 21,1% of the intervention threshold, as described in figure 2.

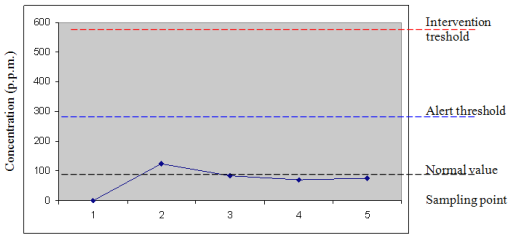

Fig.2. Variation of zinc concentration in the soil

The other measured values are below the normal value provided by the relevant legislation.

All the measurements performed for cadmium recorded the value 0 (zero) at all sampling points.

The values measured for chrome are described in the diagram in figure 3.

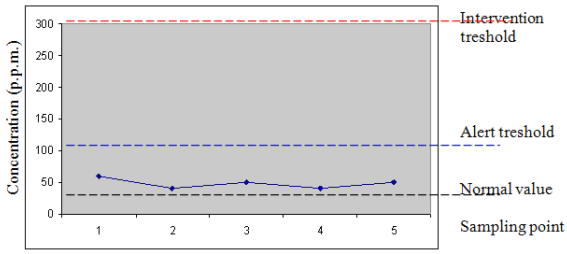

Fig.3. Variation of chrome concentration in the soil

All the values measured for total chrome are over the normal value, but below the alert and intervention thresholds.

The highest value was measured in point 1, being 81,6% over the normal value, 54,5% over the alert threshold and 18,1% over the intervention threshold.

The values resulted for lead in the five sampling points are described in the diagram from figure 4:

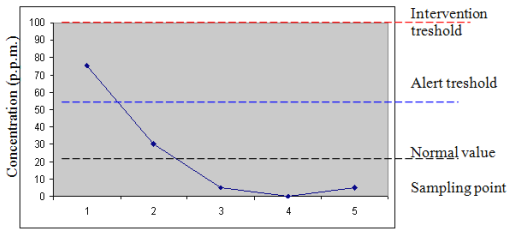

Fig.4. Variation of lead concentration in the soil

Analyzing the values resulted for lead, we notice that two of them exceeded the normal value and one of them is over the alert threshold.

The highest value was recorded in point 1, being 3,8 times higher than the normal value and approximately 1,5 higher than the alert threshold.

Conclusions

Dangerous waste are a real danger for people's health and have a negative impact on environmental factors.

- Anthrop activities that contribut to the environmental and especially soil pollution with heavy metals, is that of non-ferrous metal recovery and melting without complying with the relevant legislation.

- Experimental analyses have revealed that the values resulted for various heavy metals present in soil exceed the normal values accepted by the relevant regulations.

Adequate management of dangerous waste would decrease their negative impact through copper and lead-based non-ferrous metals recovery and melting.

Recommended for publication by Editorial board

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